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Roccella elisabethae with lichenicolous *Arthonia follmanniana* in Turkey

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Abstract—*Roccella elisabethae* and the lichenicolous fungus *Arthonia follmanniana* growing on it are reported for the first time from Turkey. Comments on their habitats, substrata, and key anatomical features are provided for each species along with habit photographs and photographs of microscopic features of the *Arthonia* that have not previously been illustrated.

Key words—*Ascomycota*, Beşparmak Island, lichens, lichenized fungi, Mersin

Introduction

Studies on the lichenized and lichenicolous fungal biota of several regions in Turkey have been recently increasing. Almost 1300 species of lichenized fungi and 200 species of lichenicolous fungi are now known from the country (Halıcı 2008; Kocakaya et al. 2015, 2016). Still, there are many areas in Turkey that are insufficiently studied or where no lichenological studies have been conducted.

There are few records of lichenized and lichenicolous fungi from the province of Mersin (Halıcı et al. 2014, Halıcı 2015). During a lichenological exploration in the vicinity of the Akkuyu Nuclear Power Plant (Silifke, Mersin) in the Eastern Mediterranean Region of Turkey, we made an excursion to Beşparmak Island located close to the power plant. On the vertical faces of siliceous rocks in the highest points of the island, we found *Roccella elisabethae* to be very common and frequently infected by *Arthonia follmanniana*; both species are new records for Turkey.

Roccella elisabethae is known from the Atlantic coast of northwest Spain (Galicia) and on islands in the warmer parts of the Atlantic Ocean (Azores,

Canary Islands, Cape Verde Islands, and Madeira; Aptroot & Schumm 2011, Carballal 2013). Previously, *Roccella phycopsis* was the only *Roccella* species known from Turkey. This subtropical genus of lichenized fungi is restricted to coastal habitats and has 32 species worldwide (Tehler et al. 2010; Aptroot & Schumm 2011).

The genus *Arthonia* includes both lichenized and lichenicolous fungi with 41 lichenicolous species previously reported from Turkey (e.g., Halıcı 2008). The holotypes of five lichenicolous *Arthonia* species are from Turkey (Steiner 1899; Candan & Halıcı 2009; Halıcı & Candan 2009, 2011).

Material & methods

The specimens reported here are deposited in Erciyes University Herbarium, Kayseri, Turkey (ERC). Examination was by standard microscopic techniques. Hand-cut sections were studied in water, potassium hydroxide (KOH), and Lugol's solution (I). Measurements were made in water. Ascospores were measured from five different ascomata for each species. Measurements are given as minimum–maximum from *N* measurements. The descriptions presented below are based on the Turkish specimens.

Taxonomy

Roccella elisabethae Tehler, Symb. Bot. Upsal. 34(1): 413. 2004 Figs 1a,b

Thallus erect, sometimes pendent; branches terete, slightly flattened, grey to slightly greenish, 1.5–3 cm long, 0.5–0.8 mm wide. Cortex a palisade plectenchyma, C+ red; medulla compact, whitish. Soralia present, laminal sometimes terminal, C+ red. Apothecia and pycnidia absent.

Specimen examined: **TURKEY**, **İçel**, Gülnar, Beşparmak Island, 36°07′18″N 33°31′58″E, alt. 35 m, on vertical faces of siliceous rocks, 11 April 2012, M.G. Halıcı (ERC AMEKA 0. 077).

Comments—The type specimen of *R. elisabethae* is from the Canary Islands (Tehler et al. 2004), and the species is also known from other Atlantic Ocean islands and the Atlantic coast of Spain (Aptroot & Schumm 2011, Carballal 2013). Our report from the eastern Mediterranean Sea therefore considerably extends its range and *R. elisabethae* should be sought in other parts of the Mediterranean.

Roccella phycopsis is morphologically similar to *R. elisabethae* but differs by its C– soralia and its yellowish medulla (Tehler et al. 2004, Carballal 2013). We note that the Turkish material of *R. elisabethae* has much shorter branches compared with the 2–10 cm cited in the original description of the species, which we attribute to the age of the specimen. Detailed descriptions and illustrations of *R. elisabethae* are provided by Tehler et al. (2004), Aptroot & Schumm (2011), and Carballal (2013).

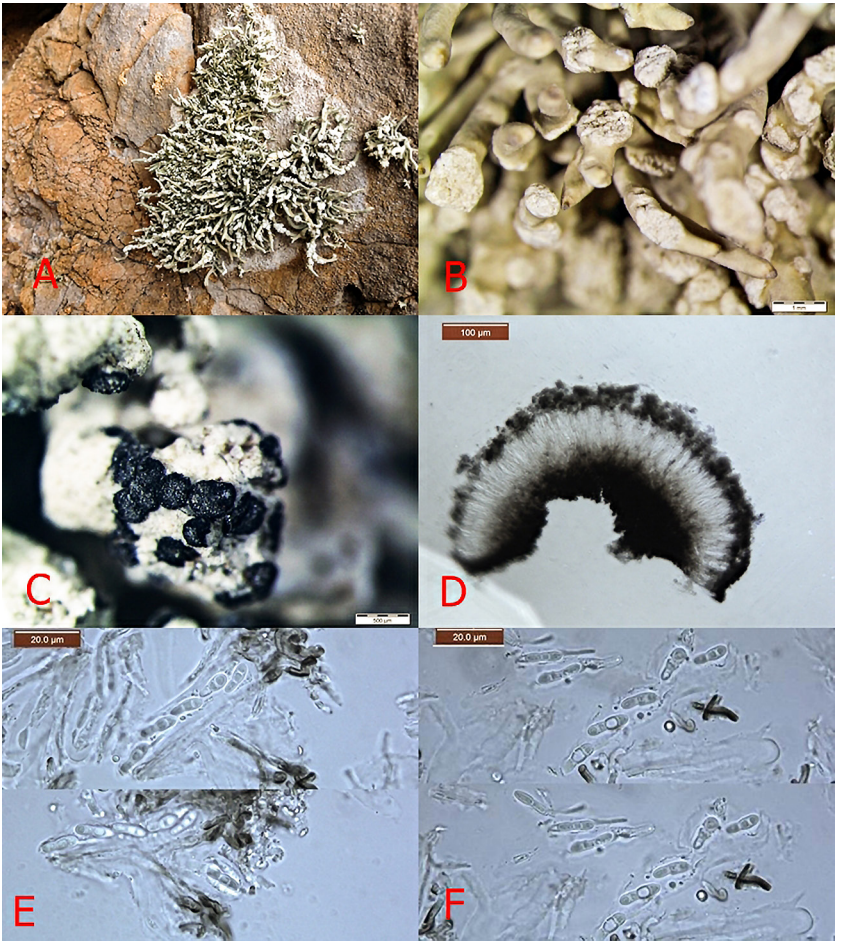

Fig. 1. ***Roccella elisabethae*** (ERC AMEKA 0.077): A, habitus; B, close view of soralia. ***Arthonia follmanniana*** (ERC AMEKA 0.104): C, habitus; D, cross section of ascomata; E, ascospores uniseriately arranged in asci; F, ascospores.

Arthonia follmanniana Diederich, Flechten Follmann: 180. 1995 Figs 1C-F

Ascomata arthonioid, 0.1–0.3 mm diam, black, sometimes with a bluish tinge due to superficial pruina, at first more or less immersed in the thallus of the host lichen, becoming sessile, and mainly on the tips of the branches. Epihymenium dark olivaceous to almost blackish; hypothecium pale to dark brownish. Hymenium colourless, about 25 µm tall; I+ red; K/I+ blue.

Asci 8-spored; ascospores uniseriately arranged in the asci. Ascospores colourless, narrowly soleiform, mostly with a wide and shorter upper cell and narrower and longer lower cell, 2–3-septate, 10–12(–13.5) × 3–4.5(–5) µm (N = 20).

Specimen Examined: **TURKEY**, **İçel**, Gülnar, Beşparmak Island, 36°07′18″N 33°31′58″E, alt. 35 m, on *Roccella elisabethae* on vertical faces of siliceous rocks, 11 April 2012, M.G. Halıcı (ERC AMEKA 0. 104).

Comments—The fungus occurred on the tips of the branches of *Roccella elisabethae*. *Arthonia follmanniana* was described on *R. galapagoensis* in Galapagos Islands (Diederich 1995) but is reported as common on *R. canariensis* and *R. fuciformis* in the Canary Isles (Hafellner 1996). *Roccella elisabethae* is a new host for this species, and the eastern Mediterranean is the third region from which the species is known. A detailed anatomical description of *Arthonia follmanniana*, illustrated with line drawings of the asci and ascospores, is provided by Diederich (1995).

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